IEEE P802.11
Wireless LANs

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| Clarification of figures in clause 4.3.27.4 GLK Service Sets |
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Abstract

This document contains proposed text changes to clause 4.2.27.4 GLK Service Sets to provide text to better describe the figures 4-13a, 4-13b, and 4-13c as discussed during the August 28 TGak Teleconference. This contribution proves red line changes relative to P802.11ak D4.2. Note the figures have also been updated to those provided in “802.11ak Figs 4-13”, [11-17/0932r6](https://mentor.ieee.org/802.11/dcn/17/11-17-0932-06-00ak-802-11ak-fig-4-13c.docx).

#### 4.3.27.4 GLK Service Sets

##### 4.3.27.4.1 Provision of the MAC service

MAC service data unit (MSDU) delivery services in an IEEE Std 802.1Q network can be supported by the 802.1AC MAC service. GLK STAs coordinate with an 802.1AC compliant GLK convergence function, to provide access to the WM via one or more Internal Sublayer Service SAPs. The routing of all MSDUs, that are provided by an 802.1Q relay entity, via GLK STAs is controlled by the routing protocols of the IEEE Std 802.1Q network that the GLK STA is attached to. This enables the routing protocols to use all the WM links available to the GLK STA, the STA’s general links.

[MSDU delivery services provided at the MAC-SAP to the LLC layer provide routing of all MSDUs. This service can use the WM, via general links provided by GLK STAs, to provide this service.]

##### 4.3.27.4.2 GLK IBSS and PBSS

A GLK IBSS or GLK PBSS can provide access to the WM via general links that are suitable for use in an IEEE Std 802.1Q network. Figure 4-13a (Example of GLK IBSS or PBSS) shows an example of a GLK IBSS involving three GLK non-AP STAs. Each participating STA provides the MAC service at the MS-SAP, with the inclusion of a station vector that is then mapped to one or more Internal Sublayer Service SAPs (ISSs) by the 802.1AC GLK Convergence Function. Four general links are shown that connect four pairs of ISS in a point to point manner. Each of the ISSs is then mapped to either an Enhanced Internal Sublayer Service (EISS) SAP or MAC-SAP, by the 802.1Q Media Independent Function or the ISS to MAC-SAP Function, respectively. The EISS SAP provides EISS services to the MAC relay entity of a VLAN bridge component (802.1Q MAC Relay Entity). The MAC-SAP provides services to the LLC Sublayer.

For example, each of the STAs and associated bridges (802.1Q MAC Relay Entities) shown could provide a wireless general link that connects the bridge associated with one STA to the bridge associated with another STA. This link could be at the top of a rack in a data center to provide inter-rack connectivity. A difference from non-GLK 802.11 is that either or both ISS SAPs could be directly connected to an IEEE Std 802.1Q bridge or network providing IEEE Std 802.1Q service that, in turn could be connected to one or more end stations. The two ISS SAPs shown could even be safely connected to the same IEEE Std 802.1Q network, since such a network provides protection from loops.

Also, shown in the figure is the possibility to provide a point to point link service between two LLC Sublayers that are each associated with a GLK non-AP STA. This link could allow a computer associated with a GLK STA to directly connect to a network attached storage (NAS) device associated with a GLK STA.

*Note: that IEEE Std 802.11 does not specify the details of the 802.1AC GLK convergence Function, the 802.1Q Media Independent Function, the ISS to MAC-SAP Function, the 802.1Q MAC Relay Entity, and the LLC Sublayer. These entities are specified in other document such as: IEEE Std 802.1AC™ (P802.1AC-REV/D4.0, August 2015) and Media Access Control (MAC) 4 Service Definition, IEEE Std 802.1Qbz™-2016, Virtual Bridged Local Area Networks — Amendment: 7 Enhancements to Bridging of 802.11 Media. These entities are shown with dashed outlines in the figure. Entities that IEEE Std 802.11 does specify are shown with solid outlines and are within the box labelled 802.11 GLK IBSS/PBSS.*



**Figure 4-13a—Example of GLK IBSS or PBSS**

A GLK PBSS similarly provides one or more linked instances of the MAC service.

##### 4.3.27.4.3 Infrastructure BSS with general links

A GLK infrastructure BSS can provide access to the WM via general links that are suitable for use in an IEEE Std 802.1Q network. Figure 4-13b (Example of infrastructure BSS with general links) shows an example of a GLK infrastructure BSS with three GLK non-AP STAs and one GLK AP. Each participating STA provides the MAC service at the MS-SAP, with the inclusion of a station vector that is then mapped to one or more Internal Sublayer Service (ISS) SAPs by the 802.1AC GLK Convergence Function. Four general links are shown that connect four pairs of ISS in a point to point manner. Each of the ISSs is then mapped to either an Enhanced Internal Sublayer Service (EISS) SAP or a MAC-SAP, by the 802.1Q Media Independent Function or the ISS to MAC-SAP Function, respectively. The EISS SAP provides EISS services to the MAC relay entity of a VLAN bridge component (802.1Q MAC Relay Entity). The MAC-SAP provides services to the LLC Sublayer.

Although transmissions by an AP are typically received by all STAs associated with that AP, the service provided by a GLK infrastructure BSS might be considered as separate point-to-point links between the corresponding ISS SAPs. Provisioning of such apparent point-to-point links is natural for MPDUs with an individually addressed RA. In order to provide such apparent point-to-point links for group addressed frames the GLK AP can transmit them so that they are accepted by a subset of the associated GLK STAs. Such selective transmission can be provided through the GLK SYNRA addressing facility (see 4.3.27.3 (Selective reception of group addressed frames)) or by serial unicast.

Three types of example general links are shown in the Figure 4-13b (Example of infrastructure BSS with general links):

* The first type is an infrastructure general link that connects non-AP GLK STA associated bridge (802.1Q MAC Relay Entity) with an GLK AP associated bridge (there are two of these general links shown in the figure). These links could be used to enhance the reliability and routing options of a IEEE Std. 802.1Q compliant LAN by providing wireless links between the bridges in the LAN.
* The second type is a non-AP GLK STA to non-AP GLK STA link which connects the STAs’ associated bridges (802.1Q MAC Relay Entities), this type of general link is similar to the IBSS or PBSS STA to STA link.
* The third type of general link is a “leaf-node” type of general link that connects entities in the LLC layer associated with a non-AP GLK STA via a general link and an IEEE Std 802.1Q bridge associated with the GLK AP to other entity available via the IEEE Std 802.1Q network associated with the GLK AP. For example, this type of connection could provide a connection between a network printer attached to the LAN to a computer associated with the non-AP GLK STA.

*Note: that IEEE Std 802.11 does not specify the details of the 802.1AC GLK convergence Function, the 802.1Q Media Independent Function, the ISS to MAC-SAP Function, the 802.1Q MAC Relay Entity, and the LLC Sublayer. These entities are specified in other document such as: IEEE Std 802.1AC™ (P802.1AC-REV/D4.0, August 2015) and Media Access Control (MAC) 4 Service Definition, IEEE Std 802.1Qbz™-2016, Virtual Bridged Local Area Networks — Amendment: 7 Enhancements to Bridging of 802.11 Media. These entities are shown with dashed outlines in the figure. Entities that IEEE Std 802.11 does specify are shown with solid outlines and are with in the box labelled 802.11 BSS.*



**Figure 4-13b—Example of infrastructure BSS with general links**

##### 4.3.27.4.4 Infrastructure BSSs with general links and in the presence of an ESS

BSSs that support general links can be components of an extended form of network by using the general links within an IEEE Std 802.1Q bridged network. In such a bridged network, the concept of the DS in a non-GLK ESS is replaced by the other components of the IEEE Std 802.1Q network. However, such a GLK topology is more general than the non-GLK infrastructure mode. For example, Figure 4-13c (Example of an ESS and extended networks with general links) shows a network consisting of three types of BSSs: a GLK infrastructure BSS (with only GLK STAs), an infrastructure BSS (with both GLK and non-GLK STAs), and a BSS (containing only non-GLK STAs). The example ESS shown in the figure consist of the all the non-GLK non-AP STAs, the non-GLK AP and the portion of the GLK AP which has associated non-GLK non-AP STAs. In the ESS the top of the portal that is connected to the DS does not show any additional connection, this is because the portal could be connected to any type of bridge, switch or LAN, hence no specific interconnection is shown. If the portal did connect to an 802.1Q compliant LAN the top of the portal would have an ISS-SAP interface. The general links shown in Figure 4-13c (Example of an ESS and extended networks with general links) are similar to those shown in Figure 4-13b and provide point to point links as described in 4.3.27.4.3. Also, shown in the figure is an example of the possible configuration of more than one 802.1Q MAC relay entity being connect to a GLK AP or GLK non-AP STA and the possible configuration of more than one GLK AP or GLK non-AP STA being connected to the same 802.1Q MAC relay entity. These configurations are shown to illustrate the flexibility of configuration available with general links.

*Note: that IEEE Std 802.11 explicitly does not specify the details of the 802.1AC GLK convergence Function, the 802.1Q Media Independent Function, the ISS to MAC-SAP Function, the 802.1Q MAC Relay Entity, the LLC Sublayer, and the Portal. These entities are specified in other document such as: IEEE Std 802.1AC™ (P802.1AC-REV/D4.0, August 2015) and Media Access Control (MAC) 4 Service Definition, IEEE Std 802.1Qbz™-2016, Virtual Bridged Local Area Networks — Amendment: 7 Enhancements to Bridging of 802.11 Media. These entities are shown with dashed outlines in the figure. Entities that IEEE Std 802.11 does specify are shown with solid outlines and are within the boxes labelled 802.11 BSS and ESS.*



**Figure 4-13c—Example of an ESS and extended network with general links**

**References:**

**[1]** 11-17/0932r6, “802.11ak Figs 4-13”, [11-17/0932r6](https://mentor.ieee.org/802.11/dcn/17/11-17-0932-06-00ak-802-11ak-fig-4-13c.docx)

**[2]** P802.11ak/D4.2, March 2017, “IEEE P802.11ak™/D4.2 Draft Standard Telecommunications and information exchange between systems – Local and metropolitan area networks Part 11: Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications Amendment 4: Enhancements For Transit Links Within Bridged Networks”,
[Draft P802.11ak\_D4.2](http://www.ieee802.org/11/private/Draft_Standards/11ak/Draft%20P802.11ak_D4.2.pdf)